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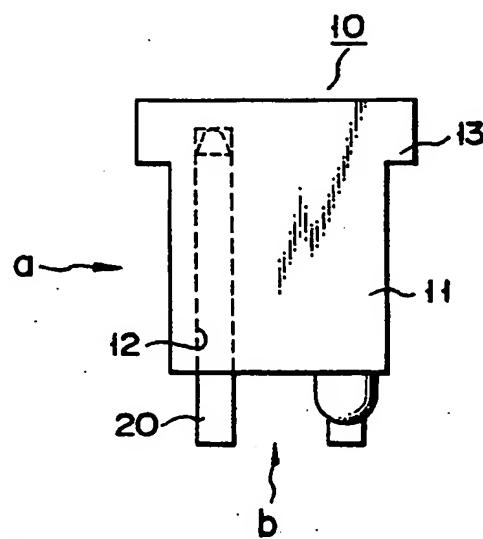
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㉙ Pin-holding device for use in connecting a pin.

㉚ A pin-holding device (10) for use in connecting a pin to a printed circuit board, comprising a substrate (11) for holding a pin to be inserted into the printed circuit board and soldered thereto, the substrate having a pin insertion hold (12) for detachably holding the pin such that at least one end portion of the pin is perpendicularly projected from the substrate, whereby the one end portion of the pin is inserted into the printed circuit board and soldered thereto in a state that the pin is held, thereafter the pin-holding device is detached from the pin



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The present invention relates to a pin-holding device for use in connecting a pin to a printed circuit board which holds the pin while the pin is inserted into the printed circuit board and soldered thereto.

As a method of electrically connecting a printed circuit board to a female connector, the method using a header is conventionally well-known. In the header, pins are perpendicularly inserted into a plastic plate and fixed thereto. Such a header is used in such a manner that one end of the pin is inserted into the printed circuit board and soldered thereto, so that one end of the pin is attached to the printed circuit board, thereafter a female connector is mated with the other end of the pin. Therefore, in a case when such a header is used, since the plastic plate of the header is provided between the printed circuit board and the female connector, the entire height of the connecting portion between the printed circuit board and the female connector is increased by the thickness of the plastic plate.

Moreover, there is a method in which only pins are directly embedded into the printed circuit board by a machine without using the above-mentioned header. However, in such a machine, since high accuracy is required in providing the space of the pins to be embedded, the embedding direction of the pin, and the depth of the embedding pin, there is disadvantage in that the manufacturing cost of the machine is increased. Moreover, in a case when the printed circuit board is thin, there is a strong possibility that the printed circuit board is split in embedding the pin by the machine. On the other hand, in a case when the pin is manually embedded, the quality thereof is not stabilized, e.g., insufficiency of embedding the pin is generated.

An object of the present invention is that the height of the connecting portion of the printed circuit board to the other element such as a female connector can be made lower and that the pin can be accurately inserted and soldered into the printed circuit board with an easy operation.

The object can be attained by a pin-holding device for use in connecting a pin to a printed circuit board, comprising a substrate for holding a pin to be inserted into the printed circuit board and soldered thereto, the substrate having a pin insertion hole for detachably holding the pin such that at least one end portion of the pin is perpendicularly projected from the substrate, whereby the one end portion of the pin is inserted into the printed circuit board and soldered thereto in a state that the pin is held, thereafter the pin-holding device is detached from the pin.

This invention can be more fully understood from the following detailed description when taken

in conjunction with the accompanying drawings, in which:

Figs. 1, 2, and 3 are the side view, front view, and the plan view of the pin-holding device of the first embodiment of the present invention respectively;

Fig. 4 is a view showing the pin used in the above pin-holding device; and

Figs. 5, 6, and 7 are the side view, front view, and the plan view of the pin-holding device of the second embodiment of the present invention respectively.

According to the present pin-holding device, the pin is soldered to the printed circuit board, thereafter the device is detached from the pin. Therefore, as compared with the use of the conventional header, the height of the connecting portion of the printed circuit board to a female connector can be made lower. Also, since the pin is inserted into the printed circuit board and soldered as being held perpendicularly to the present pin-holding present device, the pin can be surely and perpendicularly soldered without being inclined to the printed circuit board.

The substrate of the present pin-holding device is formed of plastic, and has an insertion hole through which the pin is inserted and held. It is important to form the hole such that the pin is fixed to the hole without being detached therefrom while the pin is inserted into the printed circuit board and soldered thereto, and that the pin is easily detached from the hole after the pin is soldered to the printed circuit board.

For the substrate of the present device, a suitable thickness is required so that the pin is surely held without deforming the substrate by the heat of melted solder when the pin is soldered. Moreover, if a plurality of holes are arranged in accordance with the circuit of the printed circuit board so that the plurality of pins are held at the same time, the plurality of pins can be accurately inserted into the printed circuit board at one time. As a shape of the cross section of the pin to be held in the present device, a circular cross section, a rectangular cross section, and the other shapes can be used.

According to the present pin-holding device, the height of the connecting portion of the printed circuit board to the other elements can be made lower. In addition to this matter, the depth of the hole is controlled and the length of the pin projecting from the hole is set to be a predetermined length, thereby the depth of the embedding the pin into the printed circuit board can be easily controlled. Also, by the use of the present device, danger of which the printed circuit board is split is small even if the printed circuit board is extremely thin, and there is no possibility that the pin will be inclined in soldering.

Embodiments of the present invention will be described with reference to the drawings as follows.

Fig. 1 is a side view of a pin-holding device 10 of present invention and shows the state in which a pin 20 is held by a hole 12 of a substrate 11. Figs. 2 and 3 are views of the pin-holding device 10 seen in the directions of arrows a and b. In the substrate 11, holes 12 are arranged in a lattice manner, and the pin 20 can be inserted into each hole 12.

To hold the pin in the hole by a suitable holding force, the inner diameter of the hole is set to be slightly smaller than the outer diameter of the pin, so that the pin can be held by frictional force between the hole and the pin or elastic power of a plastic material constituting the substrate in which the hole is formed, when the pin is pressed into the hole. Also, it is possible to provide a suitable projecting portion on the surface of the pin to be engaged to the hole. Moreover, an elastic member, which can hold the pin by a suitable supporting force, may be arranged in the interior of the hole, so that the pin can be held by the elastic member.

In a case of the embodiment shown in Fig. 1, the pin 20 has a small projecting portion 21 at the position corresponding to the portion close to the entrance of the hole 12 of the substrate 11, as shown in Fig. 4. Then, the pin 20 can be engaged to the hole 12 by the projecting portion 21.

The device 10 shown in Fig. 1 has a step portion 13 whose cross section is T-shaped. After the pin 20 is soldered to the printed circuit board, the step portion 13 is used as a knob in pulling the device 10 by a hand.

Figs. 5, 6, and 7 show a pin-holding device 30 of the second embodiment of the present invention. In the device 30, a hole 31 is passed through the device 30, and both ends of pin 40 are projected from the device 30. When the length of the pin is long, the thickness of the pin-holding device is made thinner than the length of the pin, thereby materials such as plastic, etc., which constitute the pin-holding device, can be reduced.

As mentioned above, according to the present pin-holding device for use in connecting a pin, the height of the connecting portion of the printed circuit board to the other elements can be made lower than the case using the conventional header, and the inserting the pin into the printed circuit board and soldering the pin thereto can be easily and surely performed.

### Claims

1. A pin-holding device (10,30) for use in connecting a pin to a printed circuit board, comprising a substrate (11) for holding a pin

(20,40) to be inserted into the printed circuit board and soldered thereto, said substrate having a pin insertion hole (12,31) for detachably holding the pin such that at least one end portion of the pin is perpendicularly projected from the substrate, whereby said one end portion of the pin is inserted into the printed circuit board and soldered thereto in a state that the pin is held, thereafter the pin-holding device is detached from the pin.

2. A device according to claim 1, wherein the pin has a projecting portion (21) which is located in the region of the entrance of the pin insertion hole.

3. A device according to claim 1 or 2, wherein the hole extends through the substrate.

4. A method of connecting a pin to a printed circuit board which comprises temporarily holding the pin in a substrate so that it projects perpendicularly therefrom, inserting the projecting portion of the pin by the desired depth into the printed board, soldering the pin into the printed circuit board and then pulling the substrate off the pin.

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